

**The Harvest Experiment: Towards Joint Calibration of the
Topex/Poseidon and Jason-1 Measurement Systems**

Bruce Haines

Jet Propulsion Laboratory, California Inst. of Tech., Pasadena CA

George Born, Dan Kubitschek

University of Colorado, Boulder

Steve Gill

NOAA National Ocean Service, Silver Spring MD

JPL

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Chevron Harvest Platform

NASA Prime Verification Site for Topex/Poseidon



Located 10 km off coast of central California

Overflown directly by T/P every 10 days (260+ overflights to date)

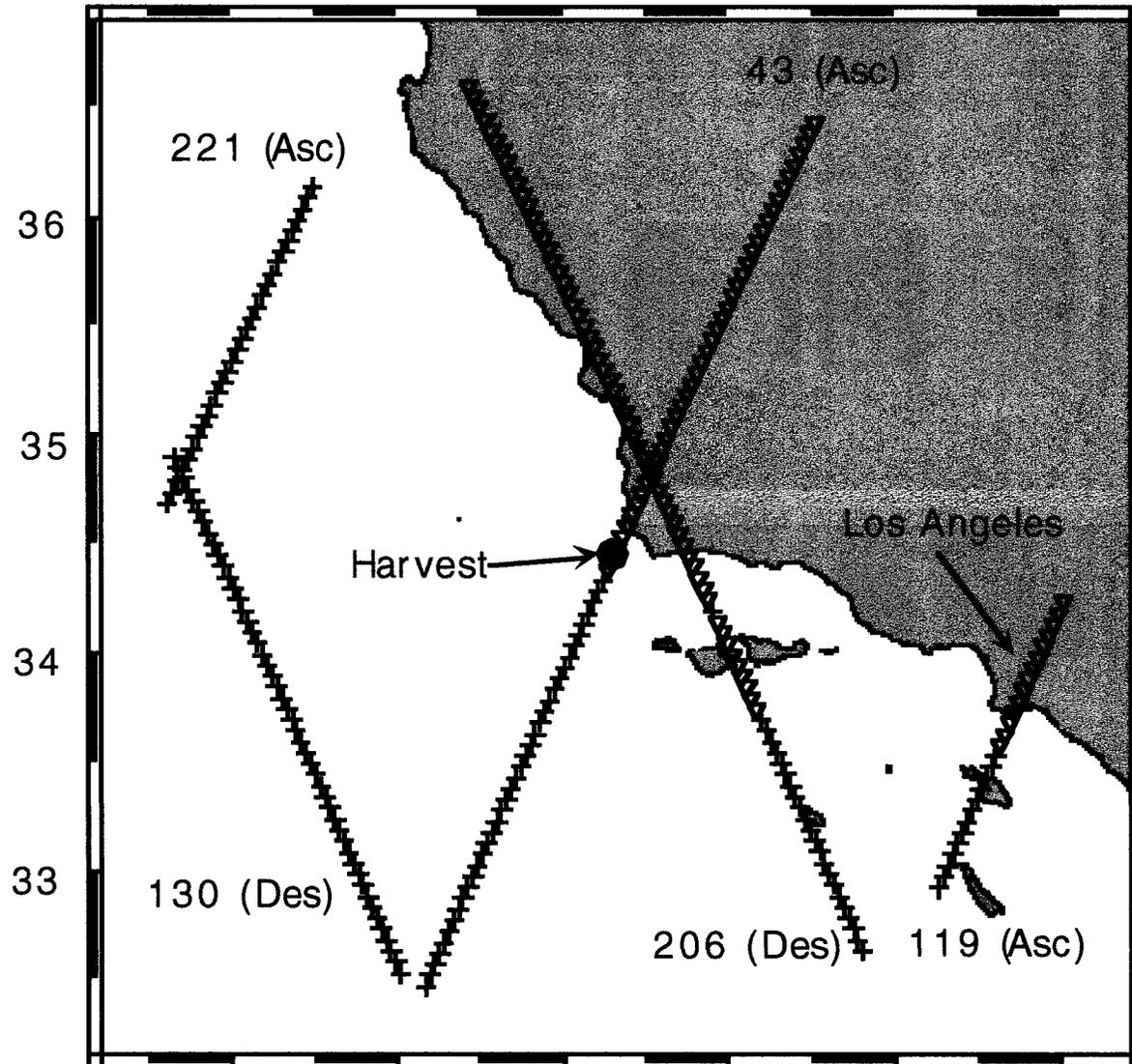
Provides independent measure of local geocentric sea level

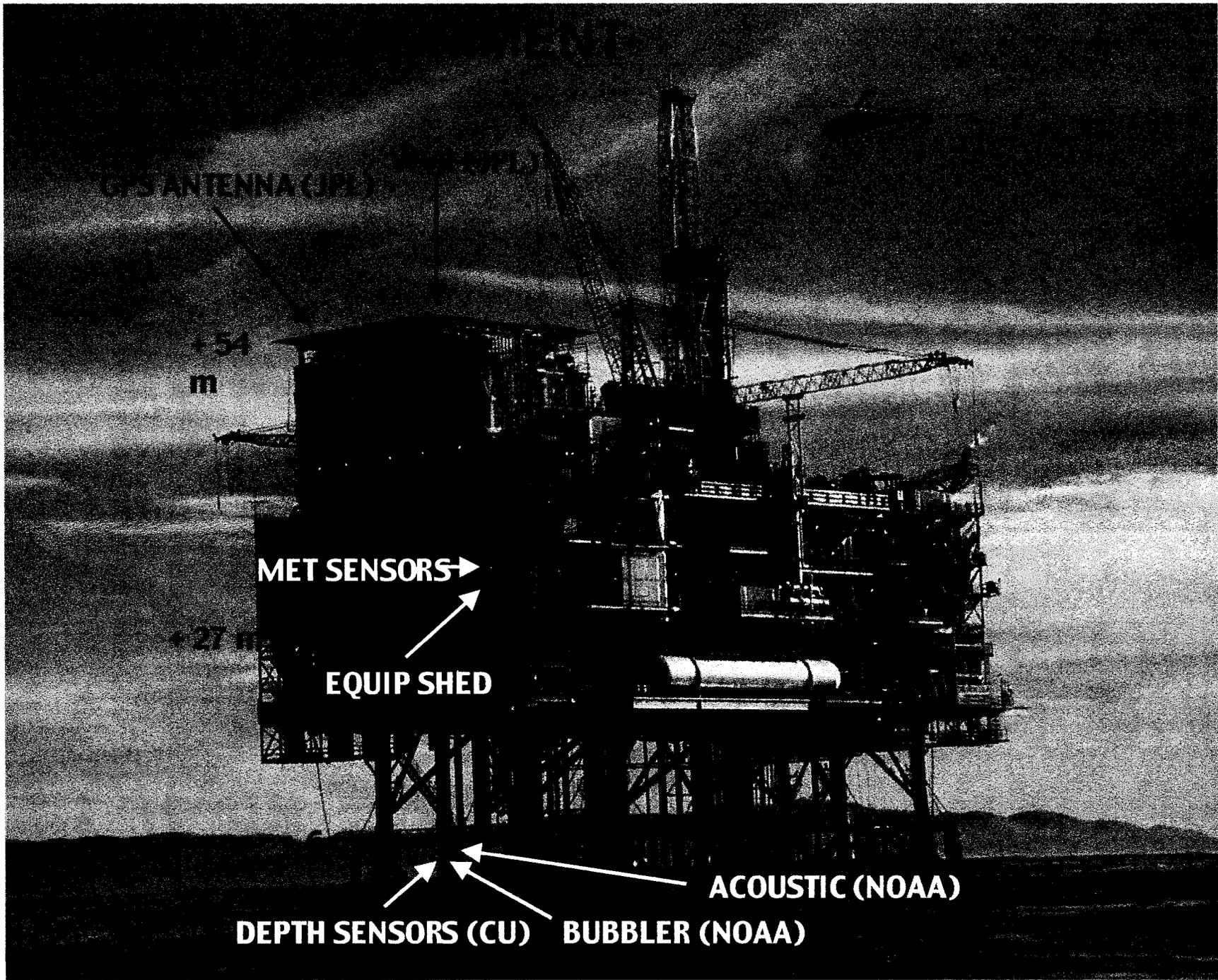
- Precise GPS receiver
- Redundant tide gauges
- Local survey



Comparing platform and satellite sea level at overflight time yields absolute bias (altimeter/orbit error).

Map of Harvest Vicinity







- **SEA LEVEL SYSTEMS**

- Jan-99: NOAA serviced NGWLMS
- Feb-99: Divers serviced and repaired riser assemblies
- Spring 99: Storms damage NOAA and CU sensors (Bubbler OK).
- June-2000 (planned): tide-gauge refurbishment

- **GPS RECEIVER**

- Operational since 1992
- Jul-99: Upgraded to ACT
- Sep-99: Radome replaced

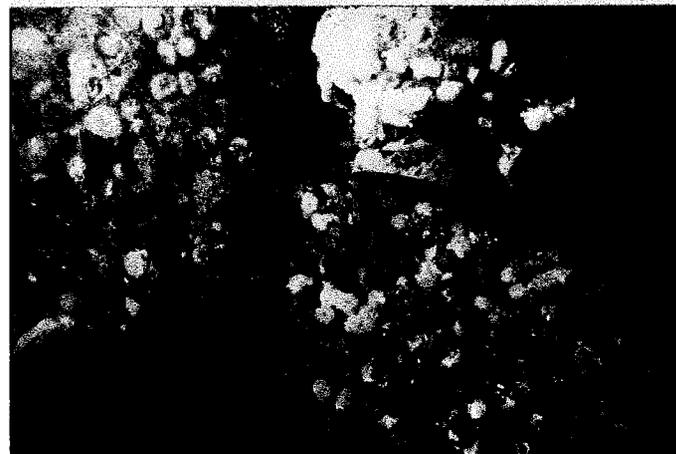
- **WATER VAPOR RADIOMETER**

- Re-deploy for Jason-1

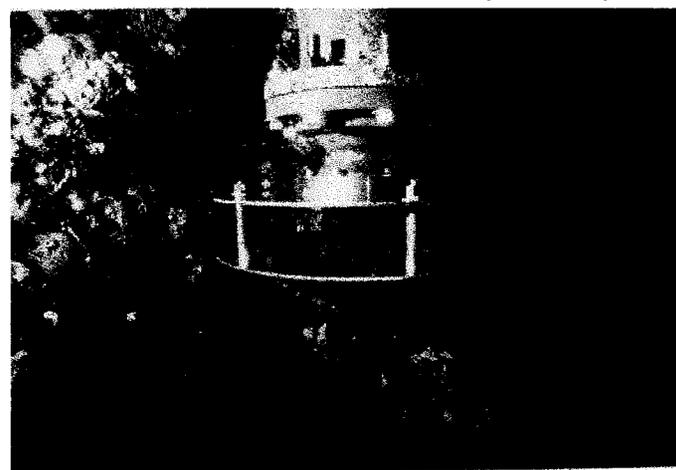
- **PLATFORM OPERATIONS**

- Now operated by Torch for Plains Resources (new owner).

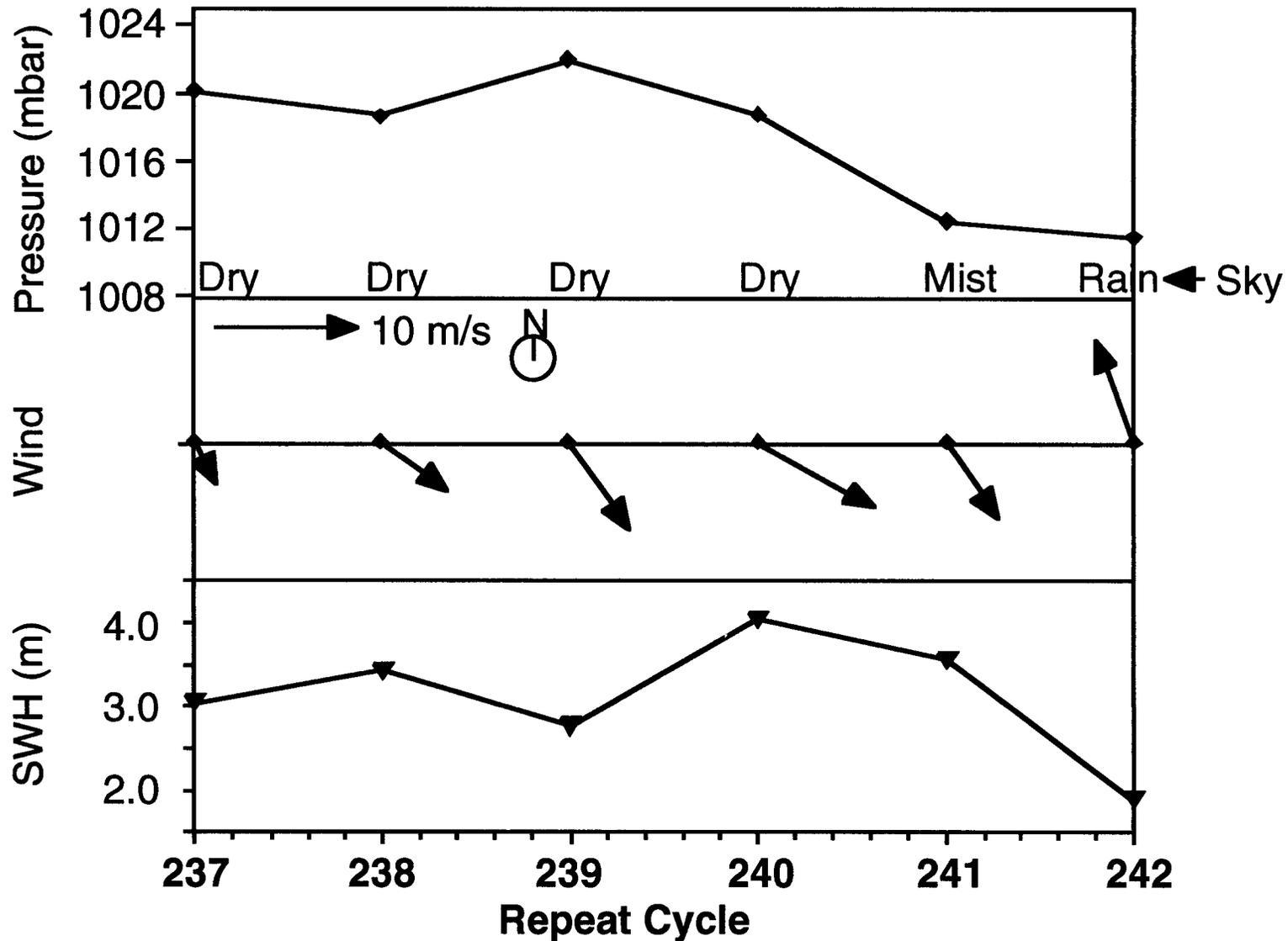
NOAA Acoustic Orifice (Before)



NOAA Acoustic Orifice (After)

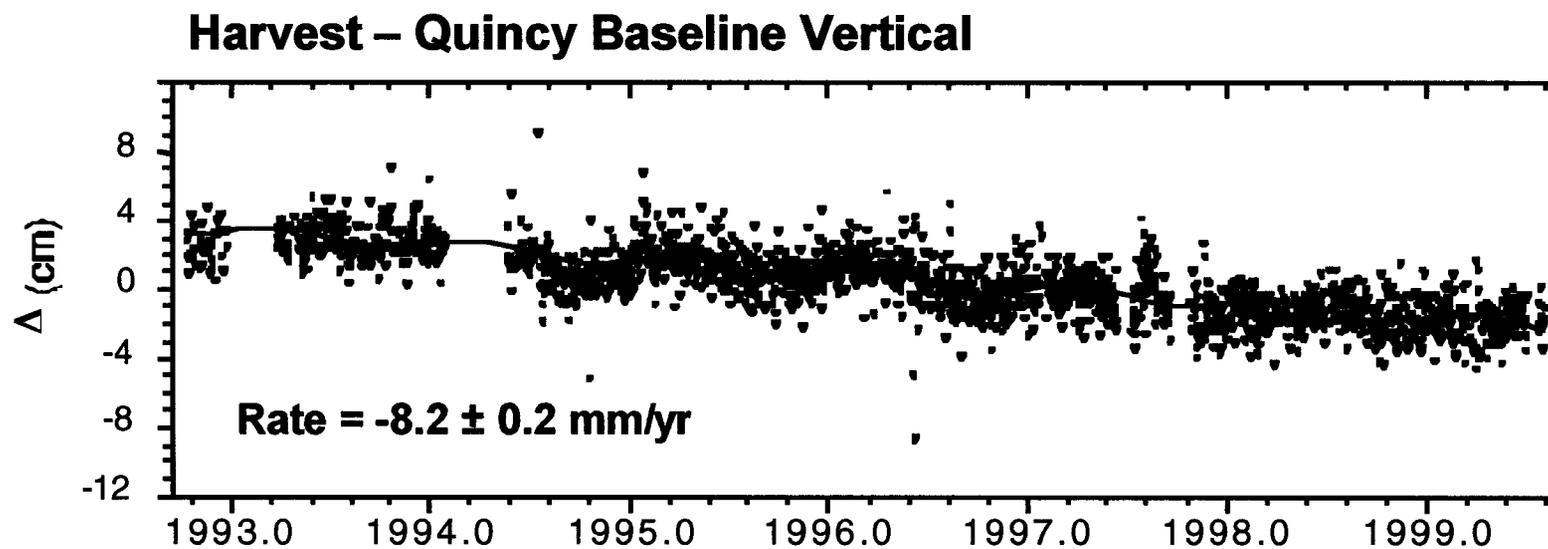


ALT-B Overflight Weather Conditions

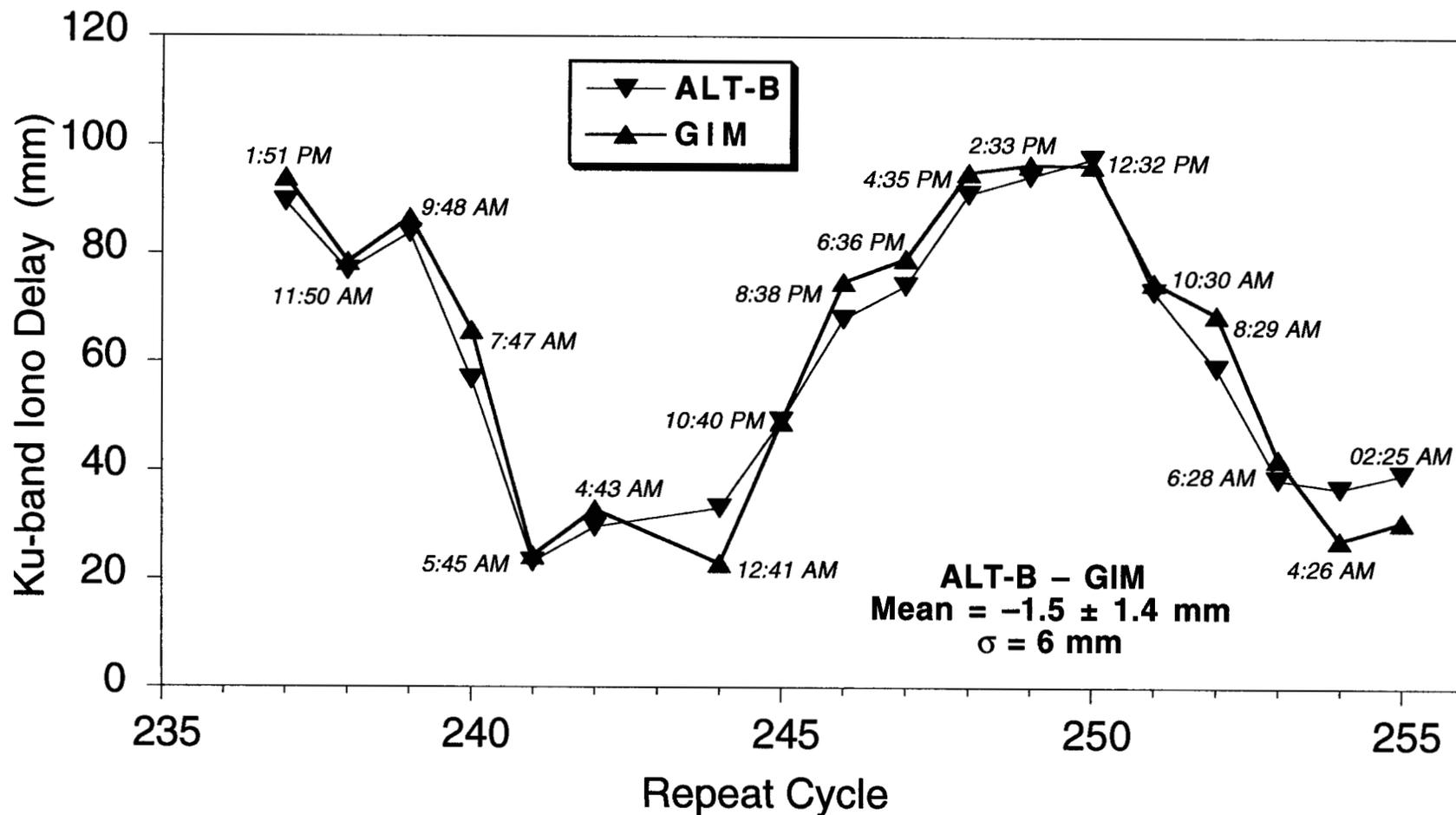




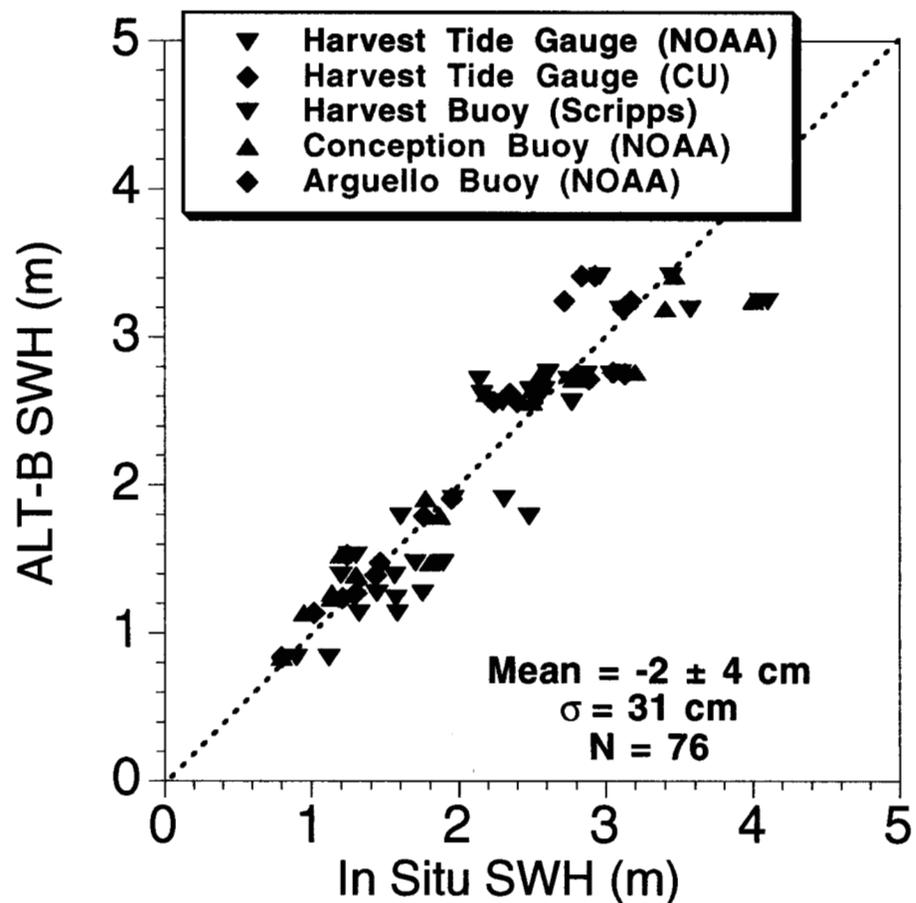
Harvest Vertical Position from GPS



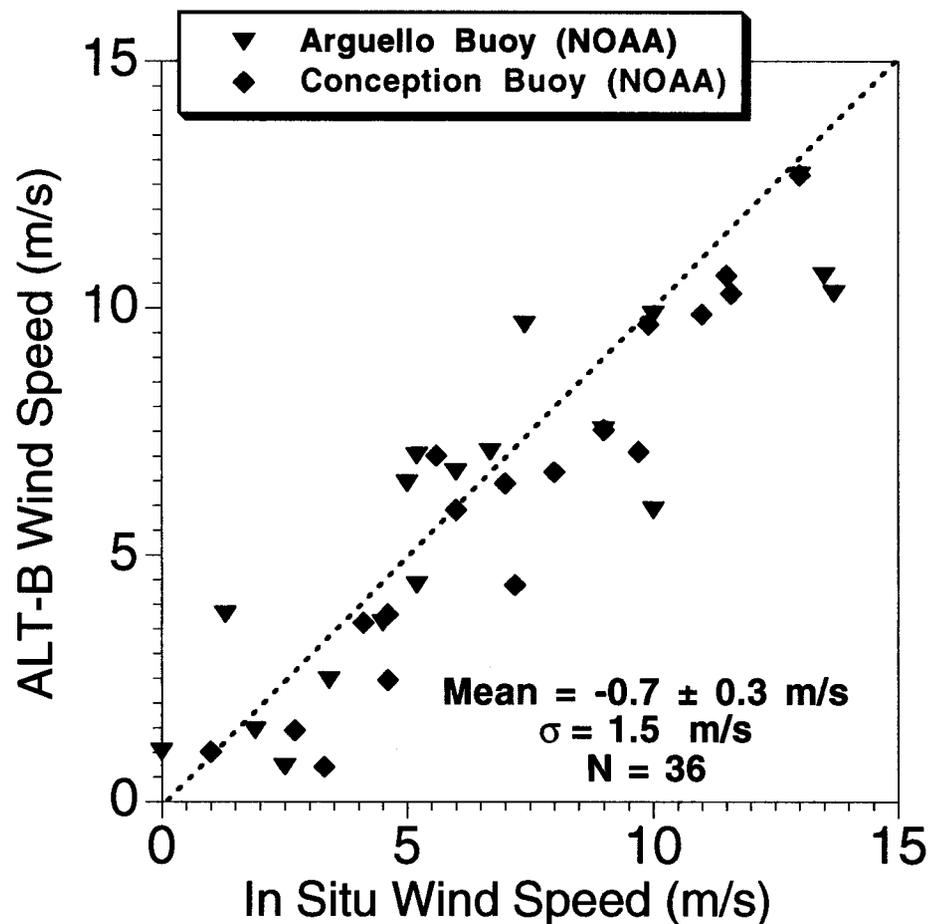
Harvest ALT-B Ionosphere Calibration



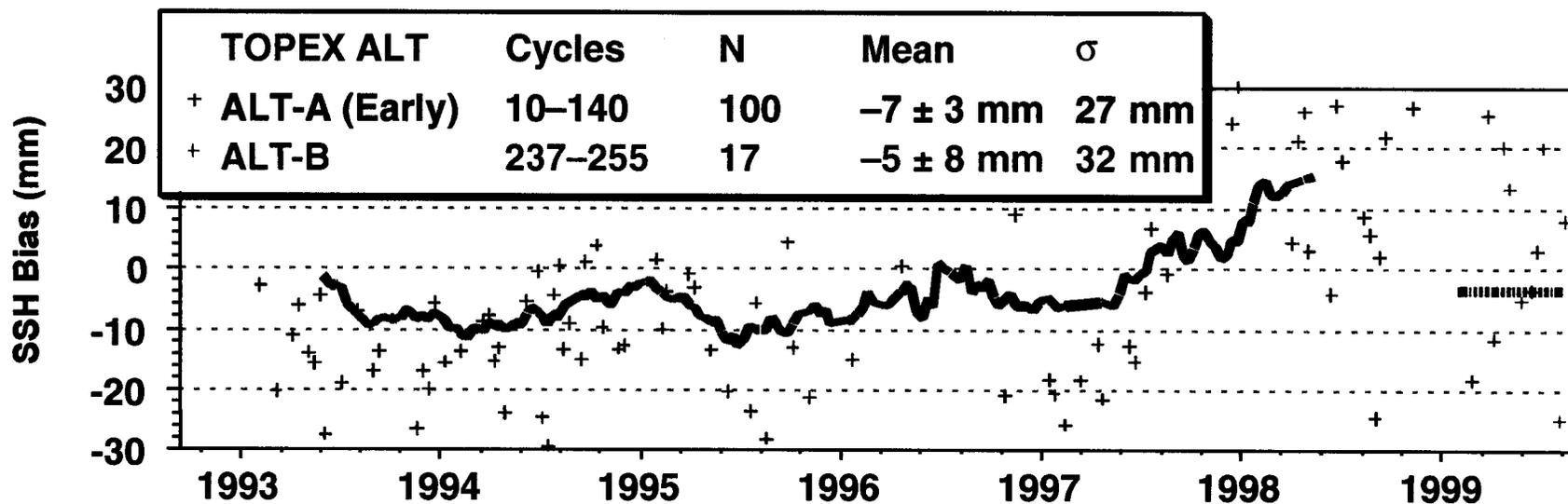
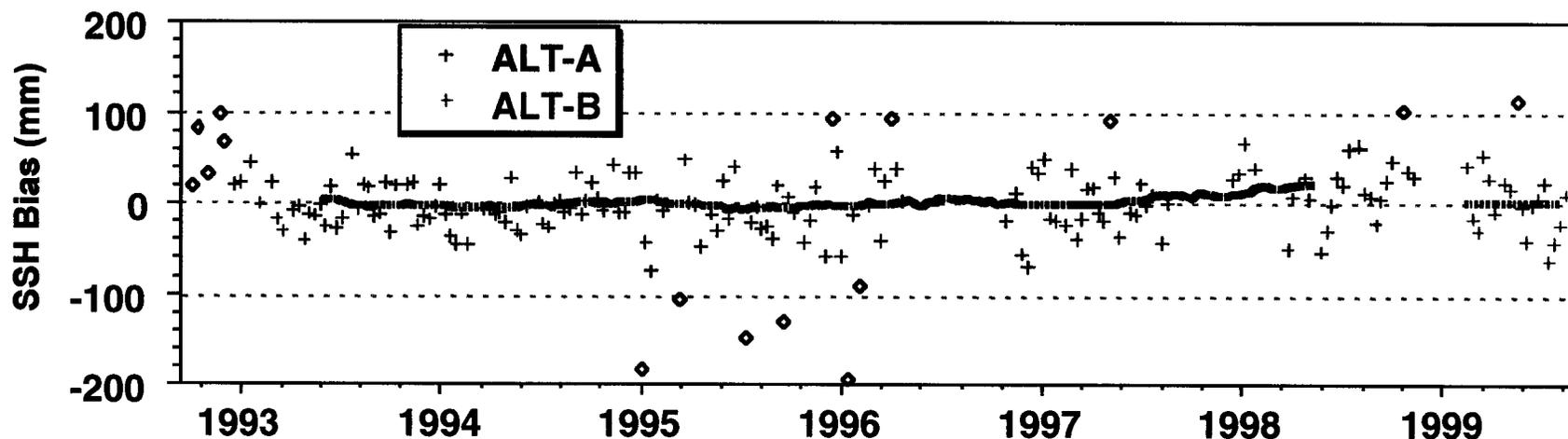
Harvest ALT-B SWH Calibration



Harvest ALT-B Wind Calibration

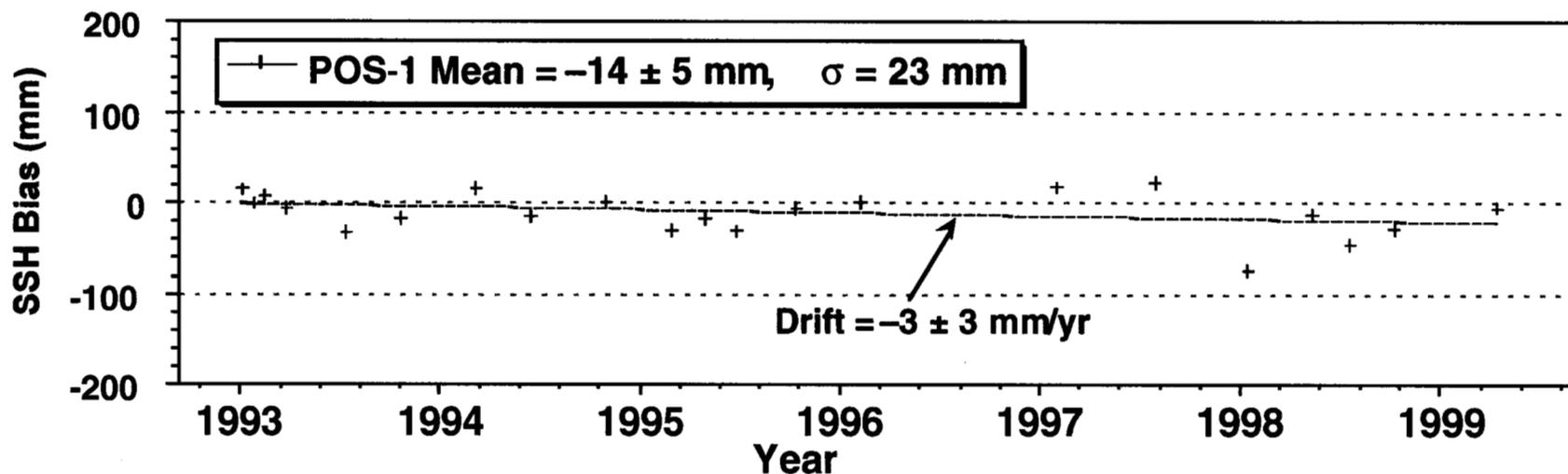


Harvest Sea-Surface Height Calibration: ALT (A vs B)





Harvest Sea-Surface Height Calibration: POS-1





Summary of Harvest ALT-B Findings

After 18 overflights:

- **ALT-B SSH Bias** **-5 ± 8 mm**
 - **ALT-B SWH Bias** **$+0.02 \pm 0.04$ m**
 - **ALT-B Ionosphere Delay Bias** **-1.5 ± 1.4 mm**
-
- **Relative SSH bias between early ALT-A and ALT-B is $+2 \pm 8$ mm.**
 - Based on ALT-A Bias (Cycles 11-140) of -7 ± 3 m.
 - **Ionosphere Δ (ALT-B – GIM) has no discernable bias.**
 - GIM should give slightly larger delay than ALT-A or B.
 - **No detectable bias in ALT-B SWH at 10 cm level.**
 - **No detectable bias in ALT-B Wind Speed at 1 m/s level.**
 - 0.7 ± 0.3 m/s bias may be due to different wind conditions at 2 buoys (37 km and 25 km distant from Harvest).



- **Relative bias between latest ALT-A (with PTR problem) and ALT-B is $+16 \pm 11$ mm.**
 - Based on ALT-A bias (Cycles 208+) of $+12 \pm 8$ mm
 - Part of relative bias may be due to 5-8 mm of accumulated corrosion on collar of NOAA tide gauge
 - **Removed in January, 1999, during servicing trip**
 - Overall result consistent with ~ 13 mm drop in global mean sea level (ALT-A Cycles 233, 235 vs ALT-B Cycles 236, 237)

Proposed Future Plans

- **Continue Harvest closure eval. for T/P ext. mission.**
 - **Emphasize stability estimates (e.g., from PTR degradation).**
 - **Use GPS and WVR to monitor TMR.**
- **Carefully monitor and reduce systematic errors.**
 - **Reduce error in estimate of platform subsidence.**
 - **Solve carrier phase ambiguities.**
 - **Improve strategies for handling troposphere & atmos. load.**
 - **Compute and average baseline results to other stations.**
 - **Improve models of tide gauge response to extreme wind/wave conditions.**
 - **Apply retracked data.**
- **Perform closure for Jason and GFO.**
- **Perform GPS bouy survey.**

➔ **Goals: 1 mm/yr accuracy of drift estimate for T/P.
5 mm relative J/T bias σ w/i 6 months.
1 cm Jason absolute bias σ w/i 6 months.**